

CLAIMS

1. A lithographic apparatus comprising:  
a support structure configured to hold a patterning device, the patterning device configured to pattern a projection beam with a pattern in its cross-section;  
a substrate table configured to hold a substrate; and  
a projection system configured to project the patterned beam onto a target portion of the substrate, wherein a joint between an element of the projection system and its support comprises an inorganic layer.
2. A lithographic apparatus according to claim 1, further comprises a liquid supply system configured to at least partially fill a space between the projection system and the substrate, with a liquid.
3. A lithographic apparatus according to claim 2, wherein the element comes into contact with the liquid.
4. A lithographic apparatus according to claim 1, wherein the inorganic layer comprises at least one of a metal, ceramic and glass layer.
5. A lithographic apparatus according to claim 4, wherein the inorganic layer is glue protection.
6. A lithographic apparatus according to claim 1, wherein said joint comprises a direct bond.
7. A lithographic apparatus according to claim 1, wherein the joint was made without heating.

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8. A lithographic apparatus according to claim 1, wherein the joint was heat treated.
9. A lithographic apparatus according to claim 8, wherein the joint has been heat treated to 900°C.
10. A lithographic apparatus according to claim 8, wherein the joint is made by the interaction of clean surfaces.
11. A lithographic apparatus according to claim 8, wherein the joint is made by the interaction of clean surfaces, sealed with a low temperature glass solder and heat treated to 600°C.
12. A lithographic apparatus according to claim 8, wherein the element of the projection system and its support are doped with boron.
13. A lithographic apparatus according to claim 12, wherein the joint is made by the interaction of clean surfaces, sealed with a low temperature glass solder and heat treated to 600°C.
14. A lithographic apparatus according to claim 1, wherein the inorganic layer comprises a metal solder.
15. A lithographic apparatus according to claim 14, wherein the metal solder is indium.

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16. A lithographic apparatus according to claim 1, wherein the element and its support are made of glass.
17. A lithographic apparatus according to claim 16, wherein the element and its support are made of fused silica.
18. A lithographic apparatus according to claim 1, wherein the joints between all parts of the projection system immersed in a liquid comprise an inorganic layer.
19. A lithographic apparatus according to claim 1, wherein the element is a lens.
20. A lithographic apparatus comprising:
  - a support structure configured to hold a patterning device, the patterning device configured to pattern a projection beam with a pattern in its cross-section;
  - a substrate table configured to hold a substrate; and
  - a projection system configured to project the patterned beam onto a target portion of the substrate, wherein a joint between an of the projection system and its support comprises a direct bond.
21. A lithographic apparatus according to claim 20, further comprises a liquid supply system configured to at least partially fill a space between the projection system and the substrate, with a liquid.
22. A lithographic apparatus according to claim 21, wherein the element comes into contact with the liquid.
23. A lithographic apparatus according to claim 20, wherein the joint comprises at least one of a metal, ceramic and glass layer.

24. A lithographic apparatus according to claim 23, wherein the joint comprises a layer of glue protection.

25. A lithographic apparatus according to claim 20, wherein the joint was made without heating.

26. A lithographic apparatus according to claim 20, wherein the joint was heat treated.

27. A lithographic apparatus according to claim 26, wherein the joint has been heat treated to 900°C.

28. A lithographic apparatus according to claim 26, wherein the joint is made by the interaction of clean surfaces.

29. A lithographic apparatus according to claim 26, wherein the joint is made by the interaction of clean surfaces, sealed with a low temperature glass solder and heat treated to 600°C.

30. A lithographic apparatus according to claim 26, wherein the element of the projection system and its support are doped with boron.

31. A lithographic apparatus according to claim 30, wherein the joint is made by the interaction of clean surfaces, sealed with a low temperature glass solder and heat treated to 600°C.

32. A lithographic apparatus according to claim 20, wherein the joint comprises a layer of metal solder.
33. A lithographic apparatus according to claim 32, wherein the metal solder comprises indium.
34. A lithographic apparatus according to claim 20, wherein the element and its support are made of glass.
35. A lithographic apparatus according to claim 34, wherein the element and its support are made of fused silica.
36. A lithographic apparatus according to claim 20, wherein the joints between all parts of the projection system immersed in a liquid comprise an inorganic layer.
37. A lithographic apparatus according to claim 20, wherein the element is a lens.
38. A lithographic apparatus comprising:  
a support structure configured to hold a patterning device, the patterning device configured to pattern a projection beam with a pattern in its cross-section;  
a substrate table configured to hold a substrate; and  
a projection system configured to project the patterned beam onto a target portion of the substrate, the projection system having a lens, a lens support and an inorganic material providing a fluid tight seal between the lens and the lens support.
39. A lithographic apparatus according to claim 38, wherein the inorganic layer comprises at least one of a metal, ceramic and glass layer.

40. A lithographic apparatus according to claim 38, further comprising a direct bond between the lens and the lens support.

41. A lithographic apparatus according to claim 38, wherein the lens and the lens support are made of glass.

42. A lithographic apparatus comprising:

a support structure configured to hold a patterning device, the patterning device configured to pattern a projection beam with a pattern in its cross-section;

a substrate table configured to hold a substrate; and

wherein a joint between an of the projection system and its support comprises a direct bond.

a projection system configured to project the patterned beam onto a target portion of the substrate, the projection system having a lens, a lens support and a direct bond providing a fluid tight seal between the lens and the lens support.

43. A lithographic apparatus according to claim 42, further comprising at least one of a metal, ceramic and glass layer at a joint between the lens and the lens support..

44. A lithographic apparatus according to claim 42, wherein a joint between the lens and the lens support was heat treated.

45. A lithographic apparatus according to claim 42, wherein the lens and the lens support are made of glass.

46. An immersion projection system manufacturing method comprising joining an element of a projection system, that in use in a lithographic apparatus comes into

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contact with a liquid, with its support using at least one of an inorganic layer or direct bonding.

47. The method according to claim 46, wherein said inorganic layer comprises at least one of a metal, ceramic and glass layer.

48. The method according to claim 46, comprising heat treating the element and its support.

49. The method according to claim 48, wherein the joining comprises creating a joint by the interaction of a clean surface of the element and a clean surface of the support.

50. The method according to claim 46, wherein the inorganic layer comprises metal solder.

51. The method according to claim 46, wherein the element and its support are made of glass.

52. The method according to claim 51, wherein the element and its support are made of fused silica.

53. The method according to claim 46, comprising joining all elements of the projection system immersed in a liquid with their respective supports using an inorganic layer.